

# On one year adjoint/Argo estimates

- *Forget, Ferron, Mercier 08* (Oc. Mod.)
- *Forget, Mercier, Ferron 08* (Oc. Mod.)
- *Forget 09* (JPO, in rev.)
- *Maze, Forget, Buckley, Marshall 09* (JPO, in rev.)
- *Forget, Maze, Buckley, Marshall 09* (to be subm.)

Gael Forget

## Period of interest:

Argo rich period, from ~2004

⇒ much consolidated data base for those recent years

⇒ room for better understanding of ocean behavior.

## Incentive for GCM-interpolation:

complement obs. constraints with dyn./atm. constraints  
and extend interpretation of observations.

## Objection to GCM-interpolation:

errors in dyn./atm. may prevent close fit to obs.

⇒ a basic matter of balance amongst the various constraints.

What is the trade-off in 1 year adjoint estimates:

- + rather large data base over one year
- + relatively easy to achieve close fit to obs.
- + (-?) GCM dynamics imposed up to seasonal cycle
- (+?) adjustments to dynamics for longer time-scales

Some success with 1 degree resolution, global, over 2004-5-6.

close fit to obs.

extended interpretation of observation

... eddying follow on.



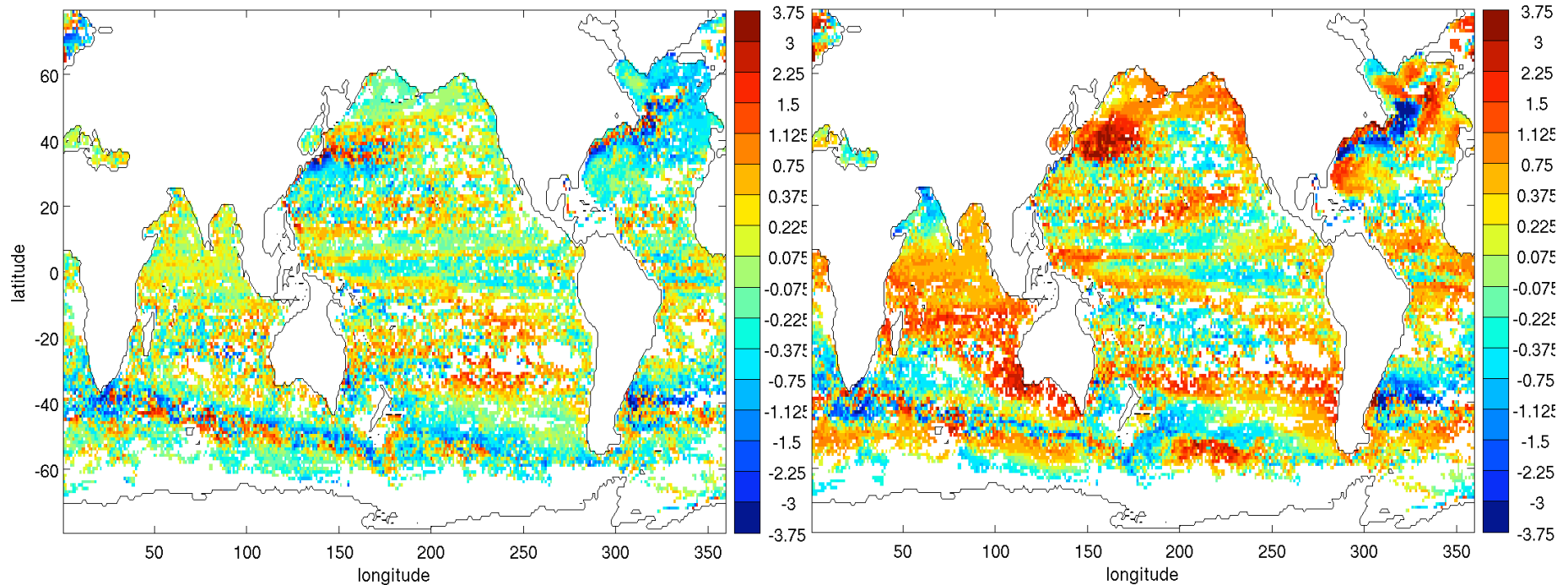
**achieving a close fit to Argo**

# Misfit to Argo

## T, 300m, 2004-2006

**WOA01-Argo**

**ECCO2-Argo**



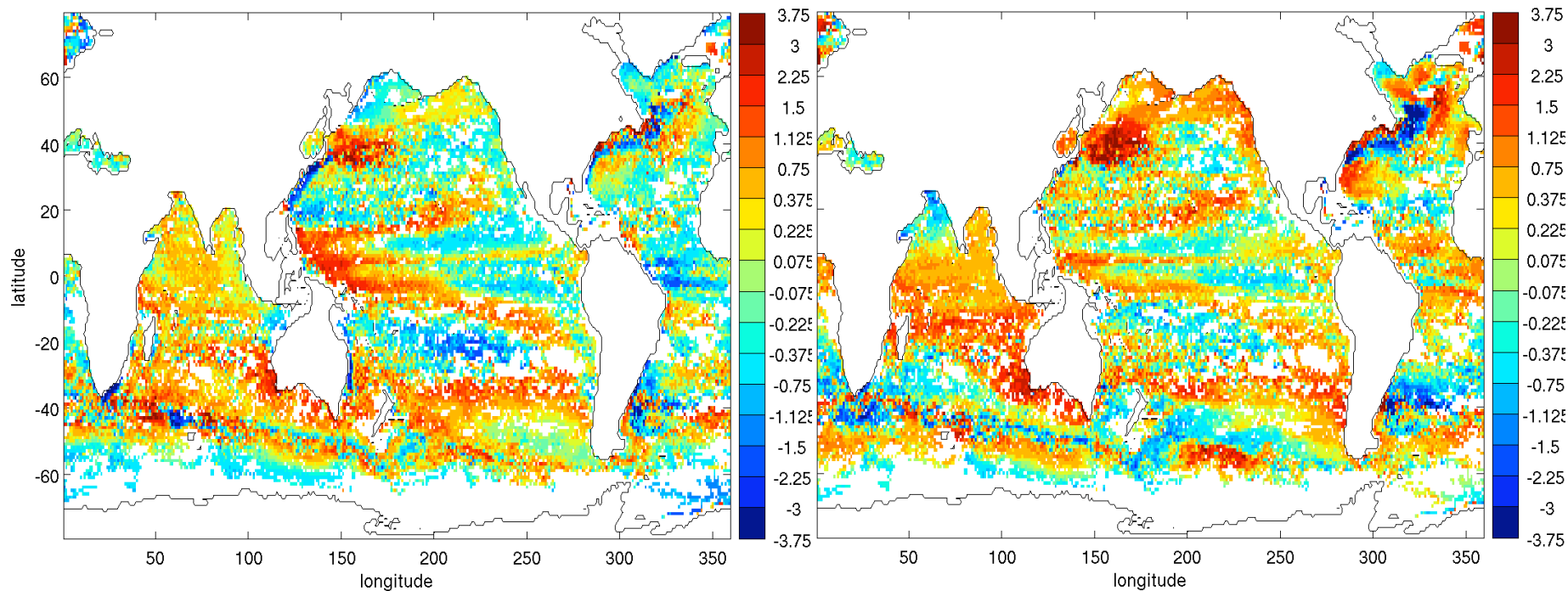


# Misfit to Argo

## T, 300m, 2004-2006

**ECCO1.3-Argo**

**ECCO2-Argo**

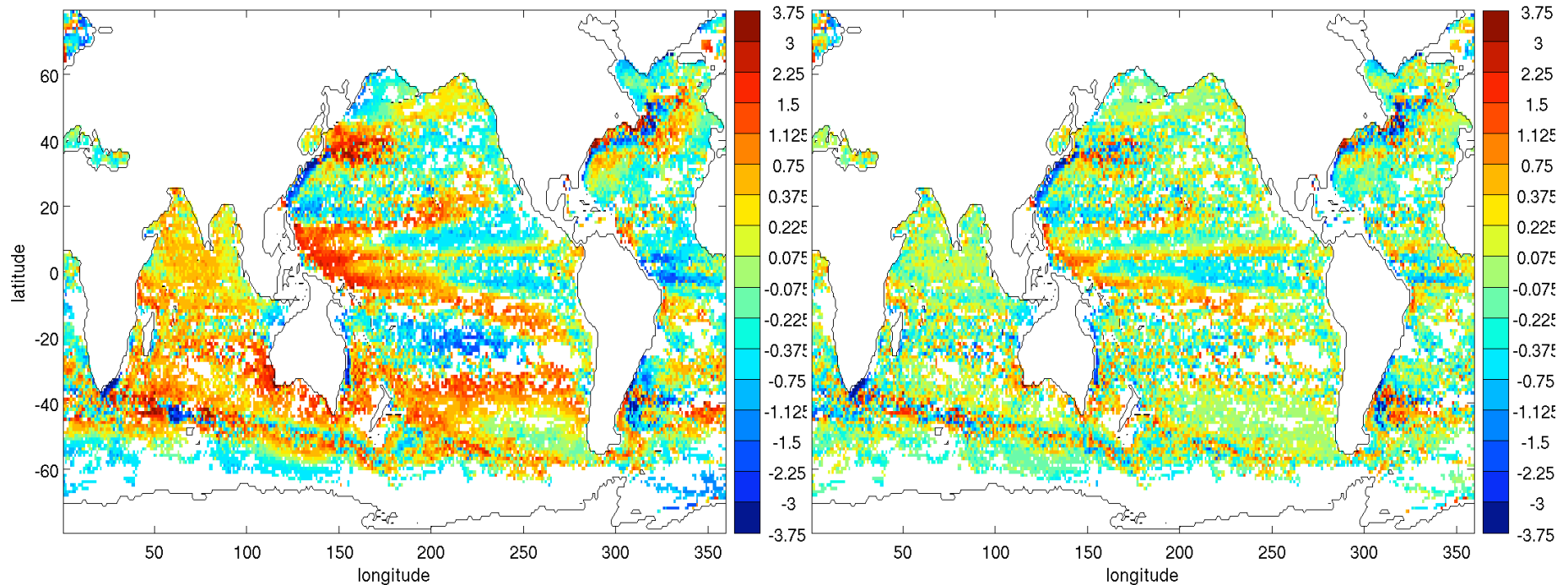


# Misfit to Argo

## T, 300m, 2004-2006

**ECCO1.3-Argo**

**OCCA-Argo**

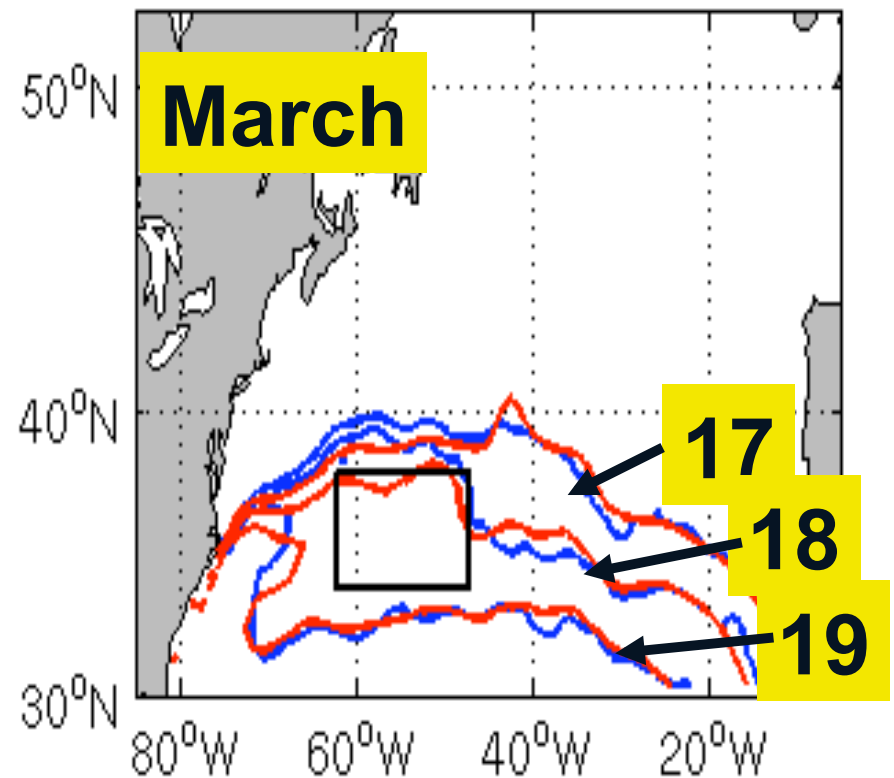
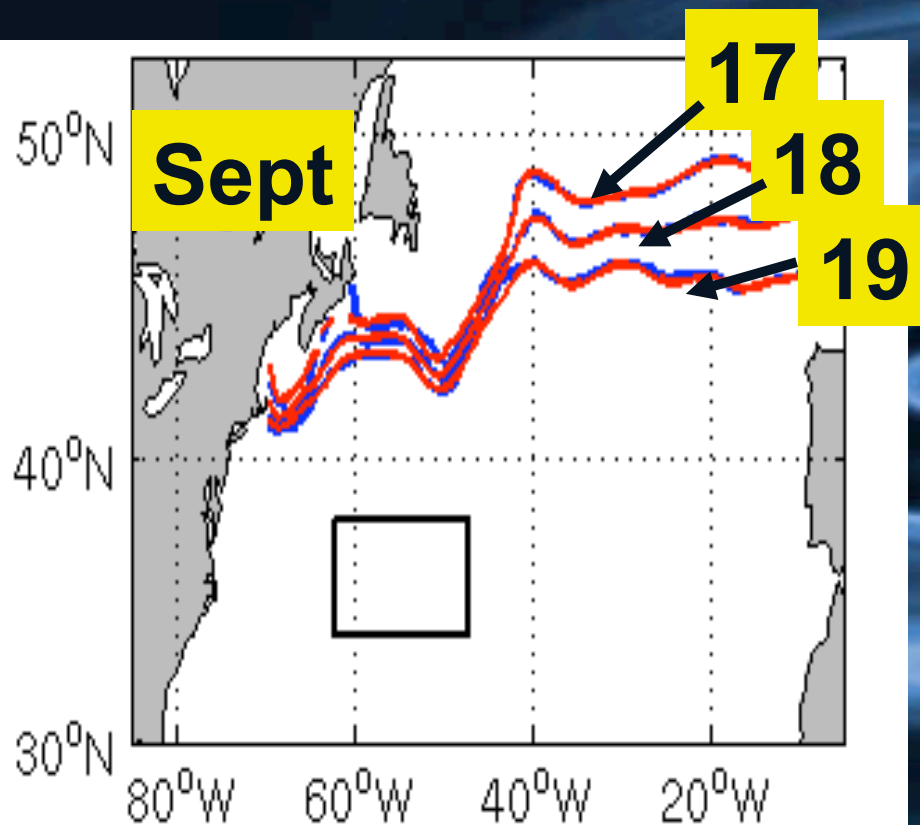




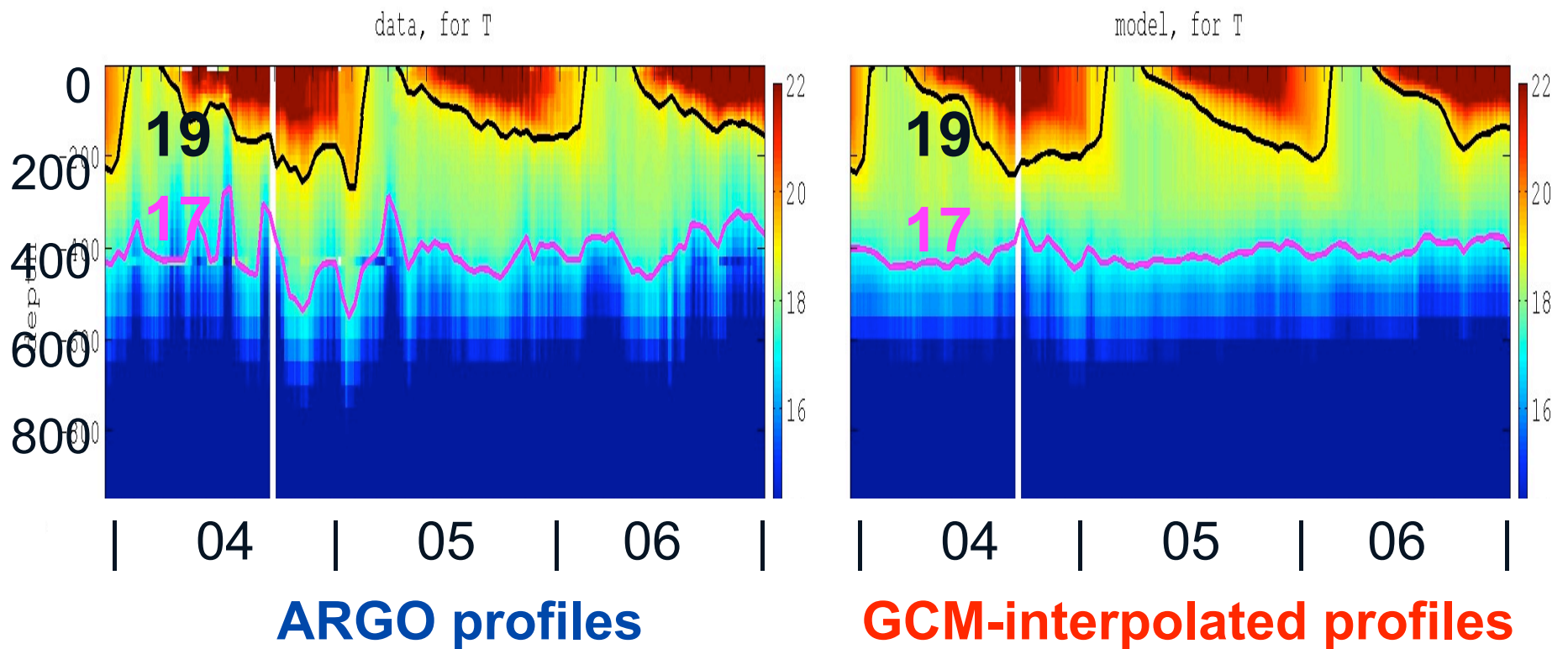
# **Extended interpretation of observations**



# EDW layer at the surface

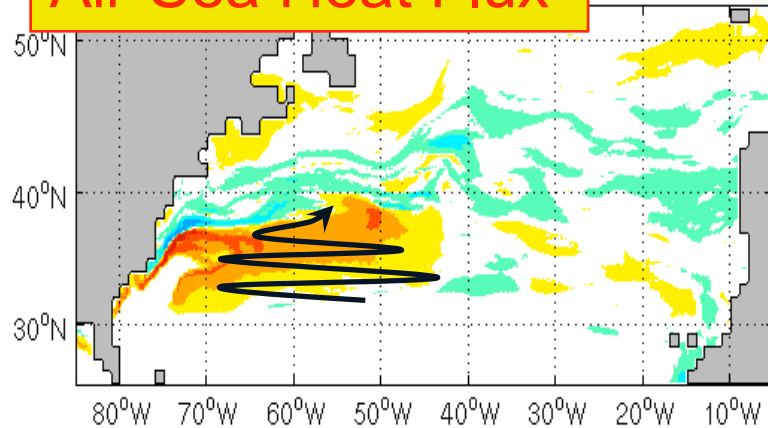


# EDW layer below the surface

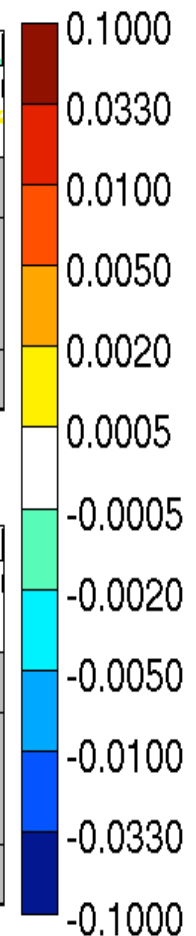
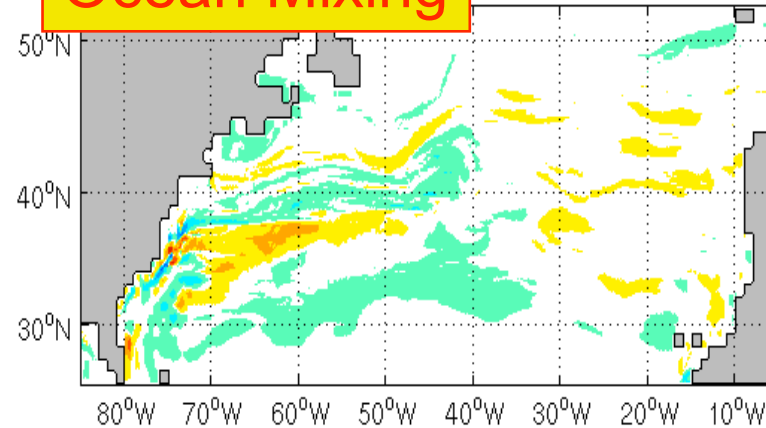


# EDW layer volume budget

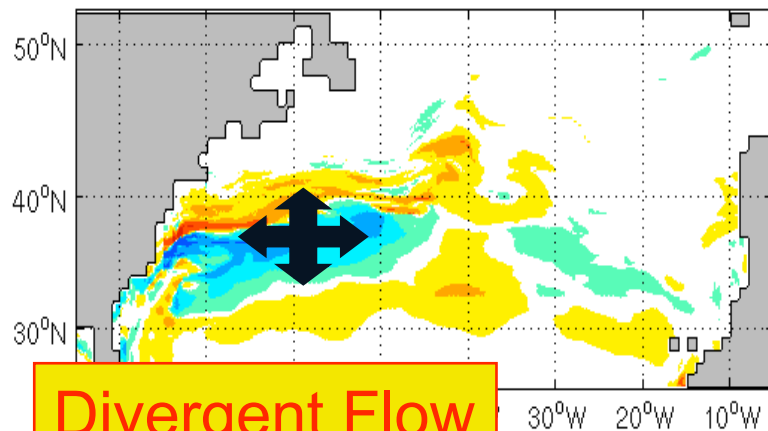
Air-Sea Heat Flux



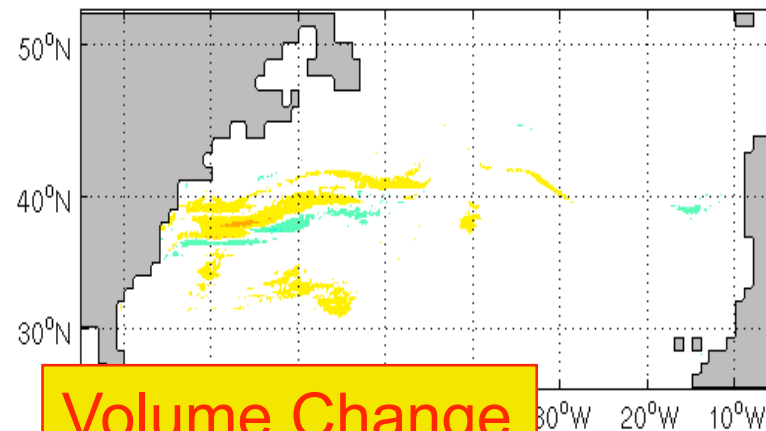
Ocean Mixing



Divergent Flow



Volume Change





... eddying follow on



From Green's function to Adjoint:

practical for large dimension problem

well-adjusted to both regional & global fitting

1 year, global, 1/6 degree:

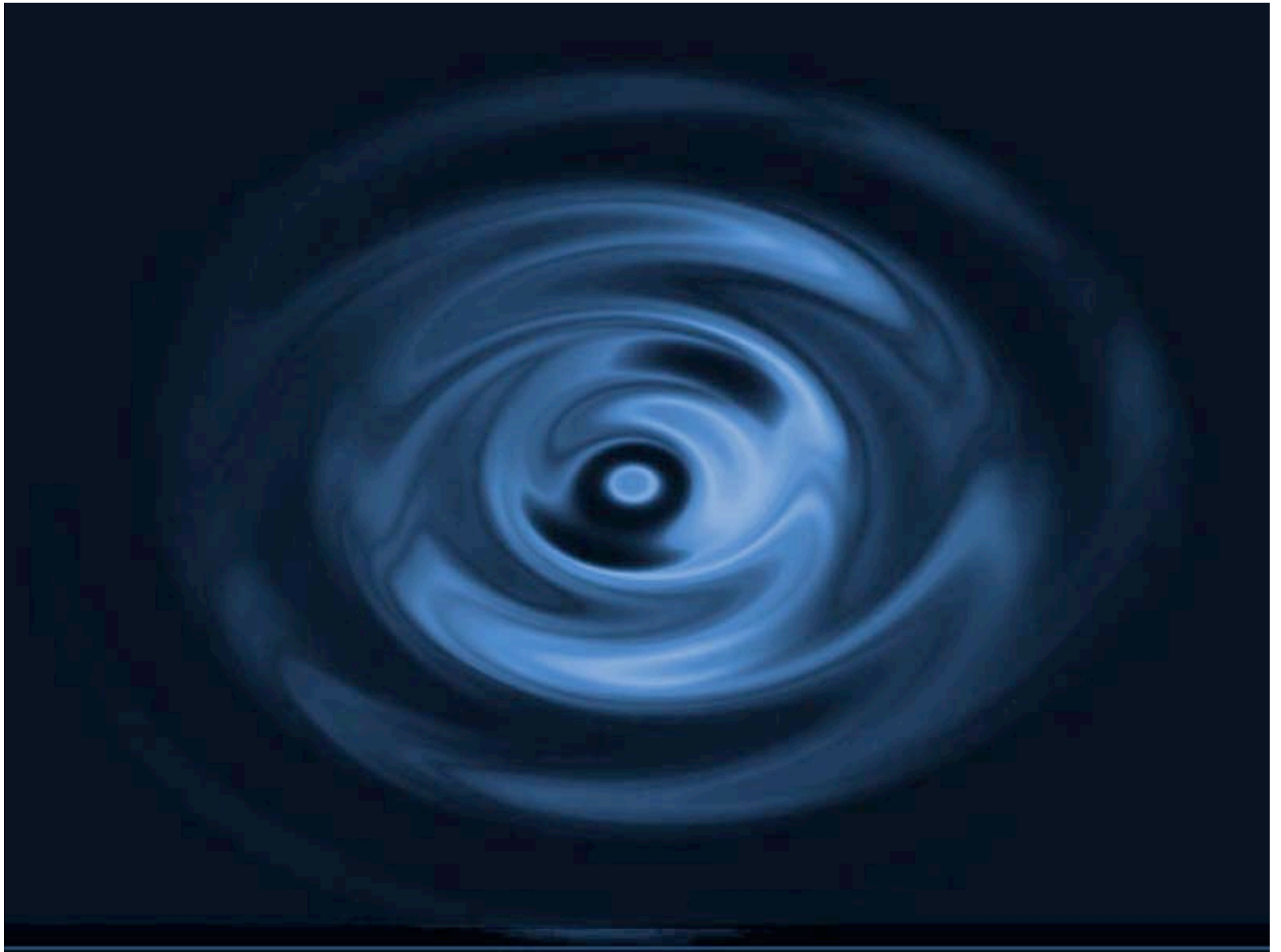
manageable computational cost

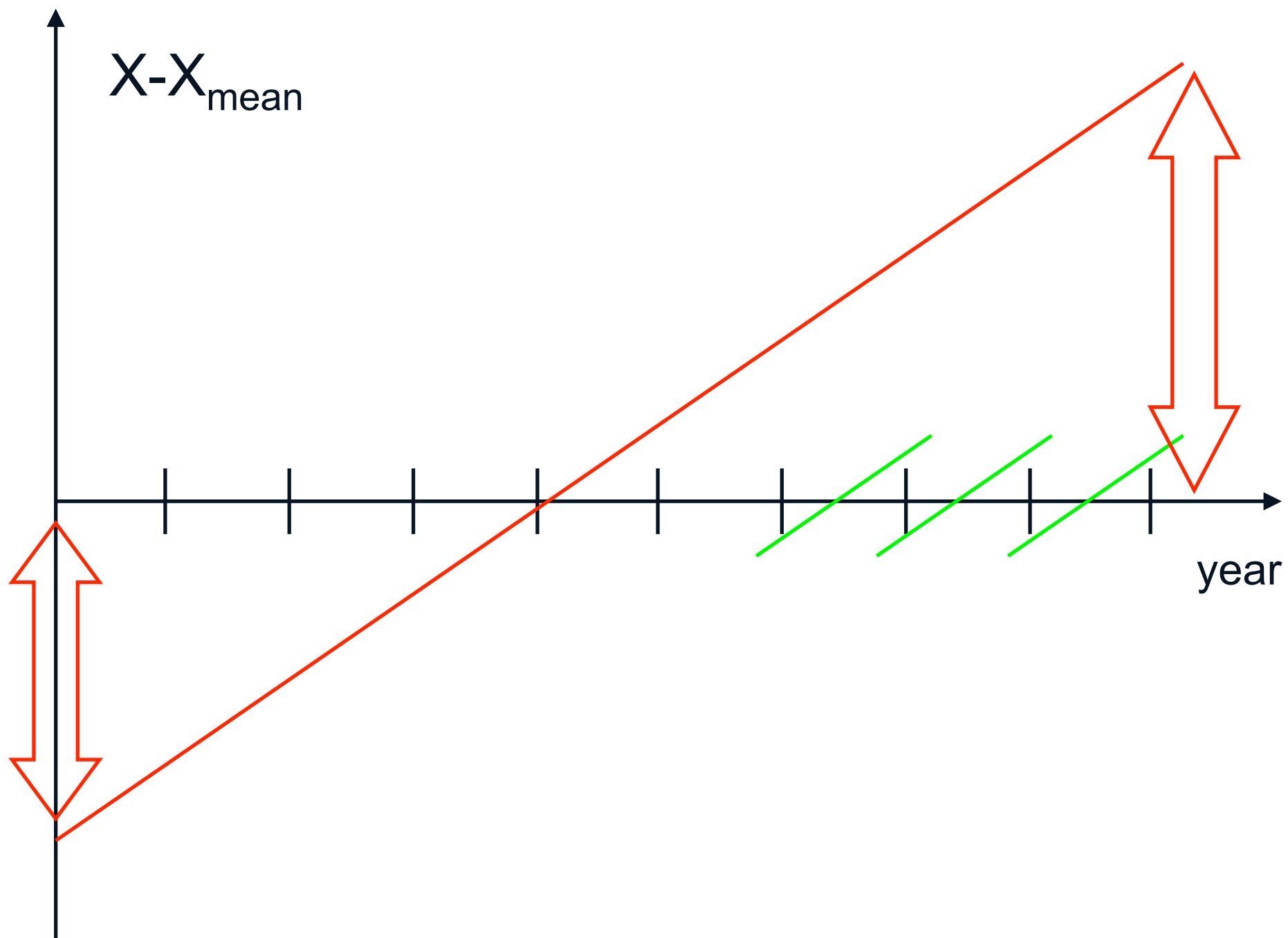
fairly close fit, water mass studies, etc.



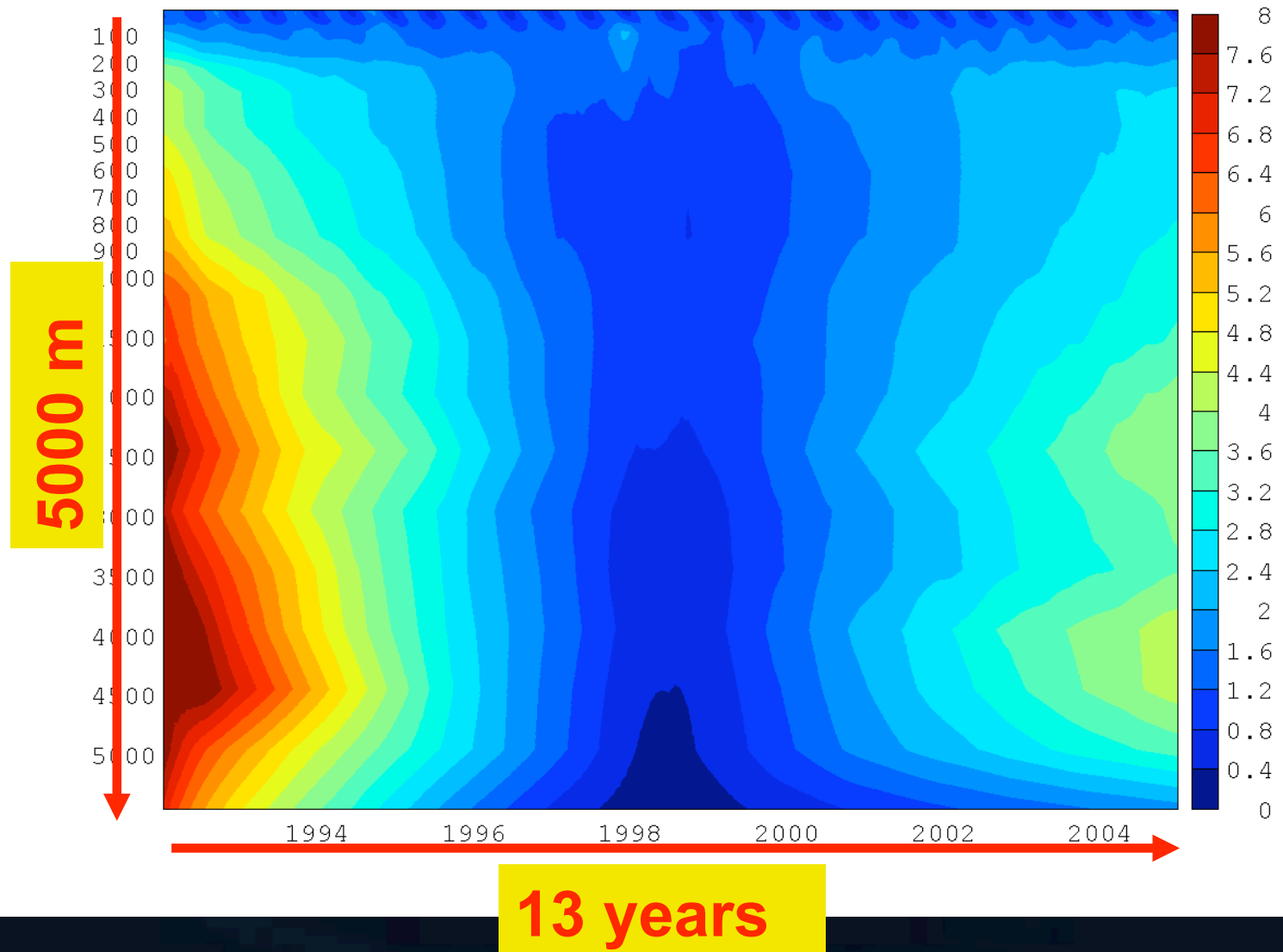
## Components in practice

Adjoint	ok for cube sphere
Line Search	ok offline
Controls	ok for Init./forcing/mixing
Observations (?)	same as for 1 degree
Error covariances	same as for 1 degree (?)
first guess/spin-up	start from 1 degree results

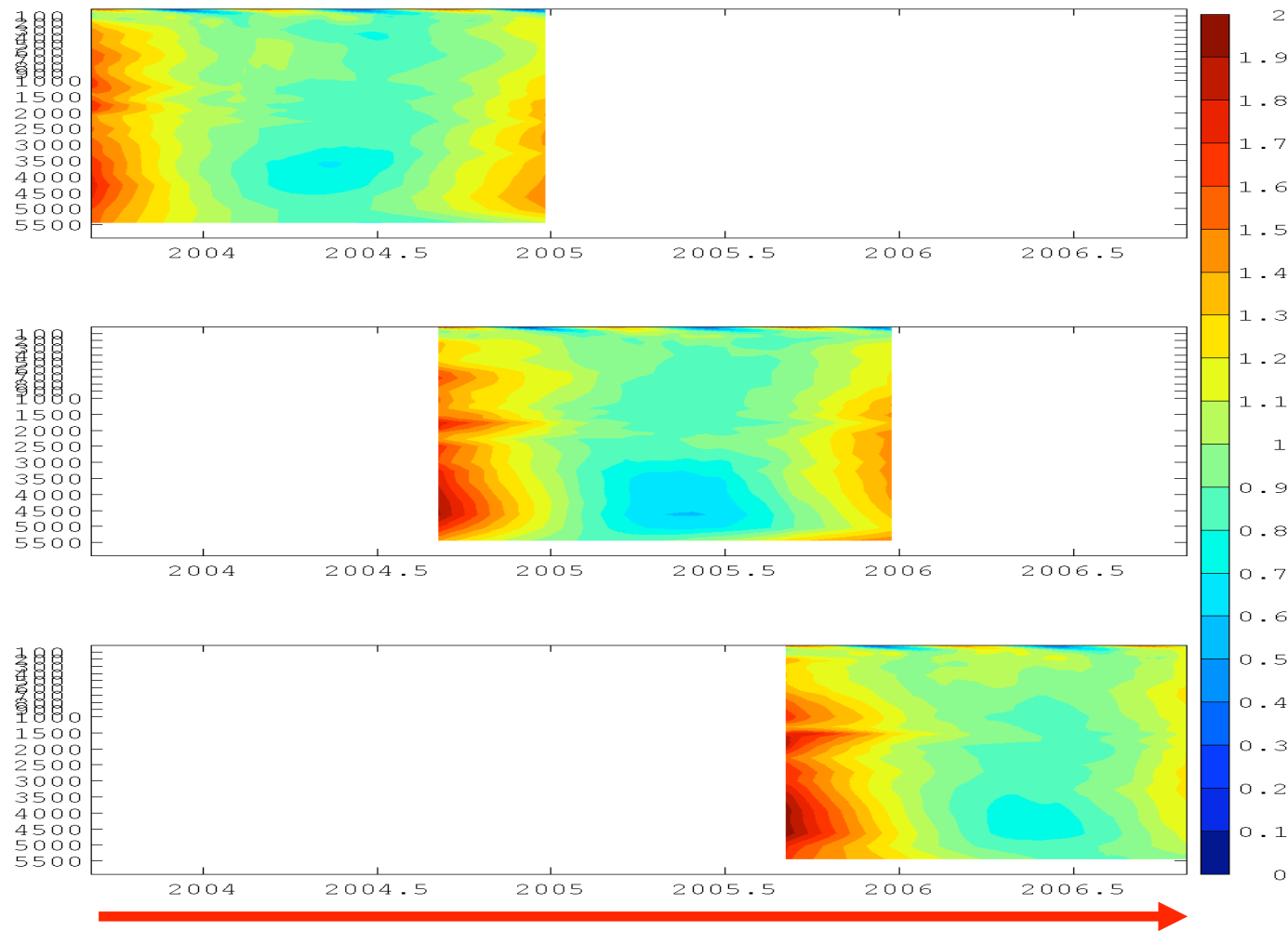




# ECCO1.2



# OCCA

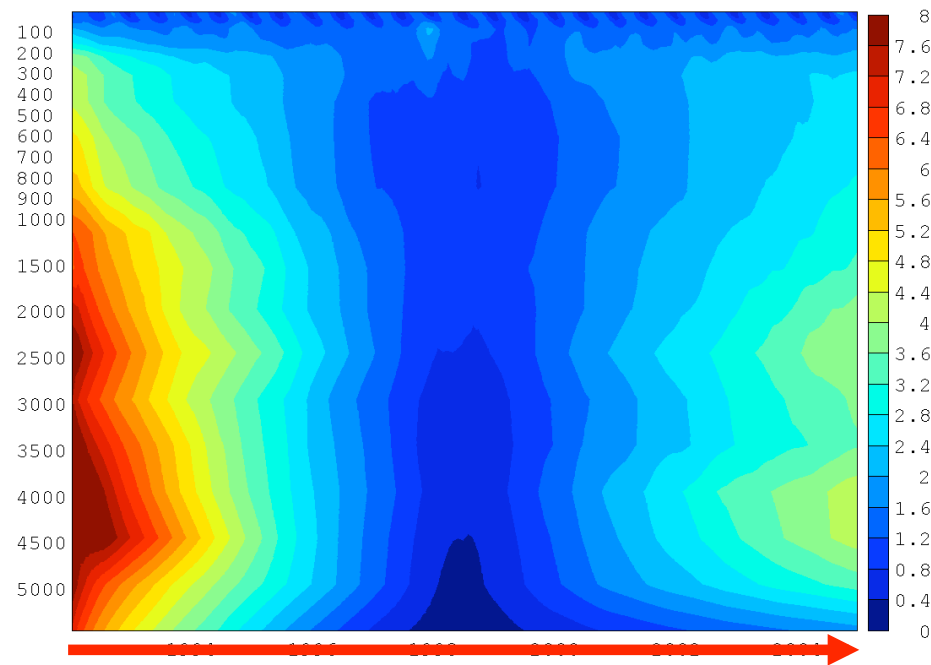


3 years

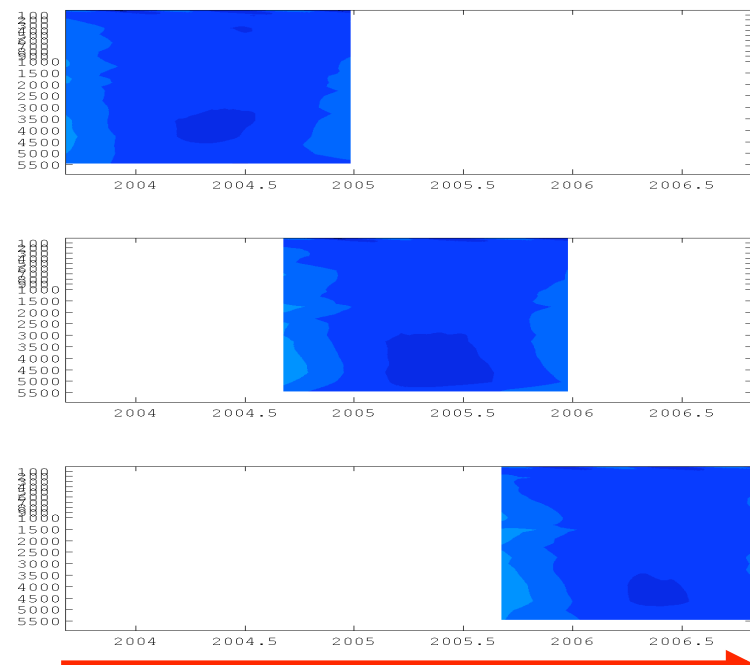


**ECCO1.2**

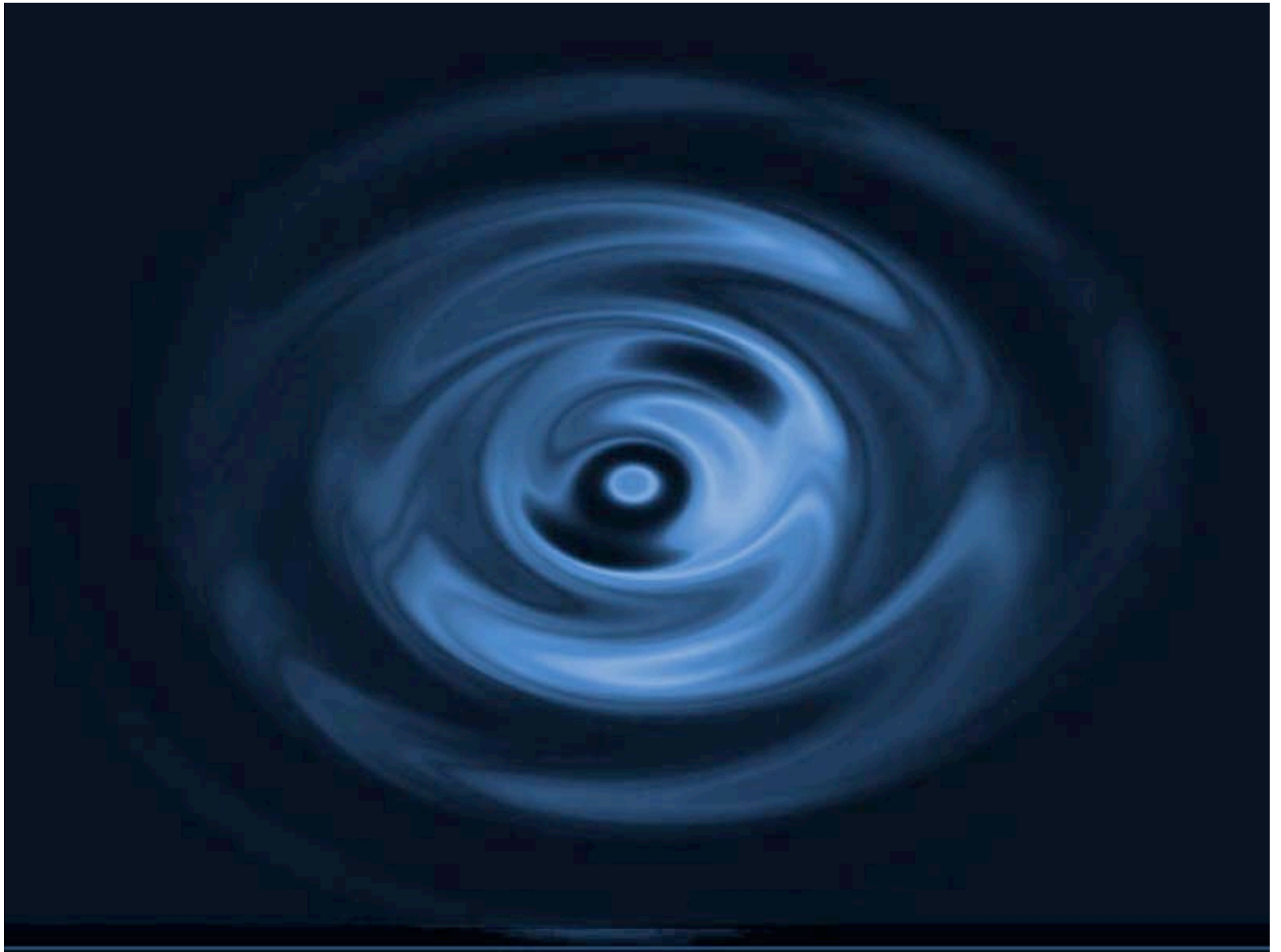
**OCCA**

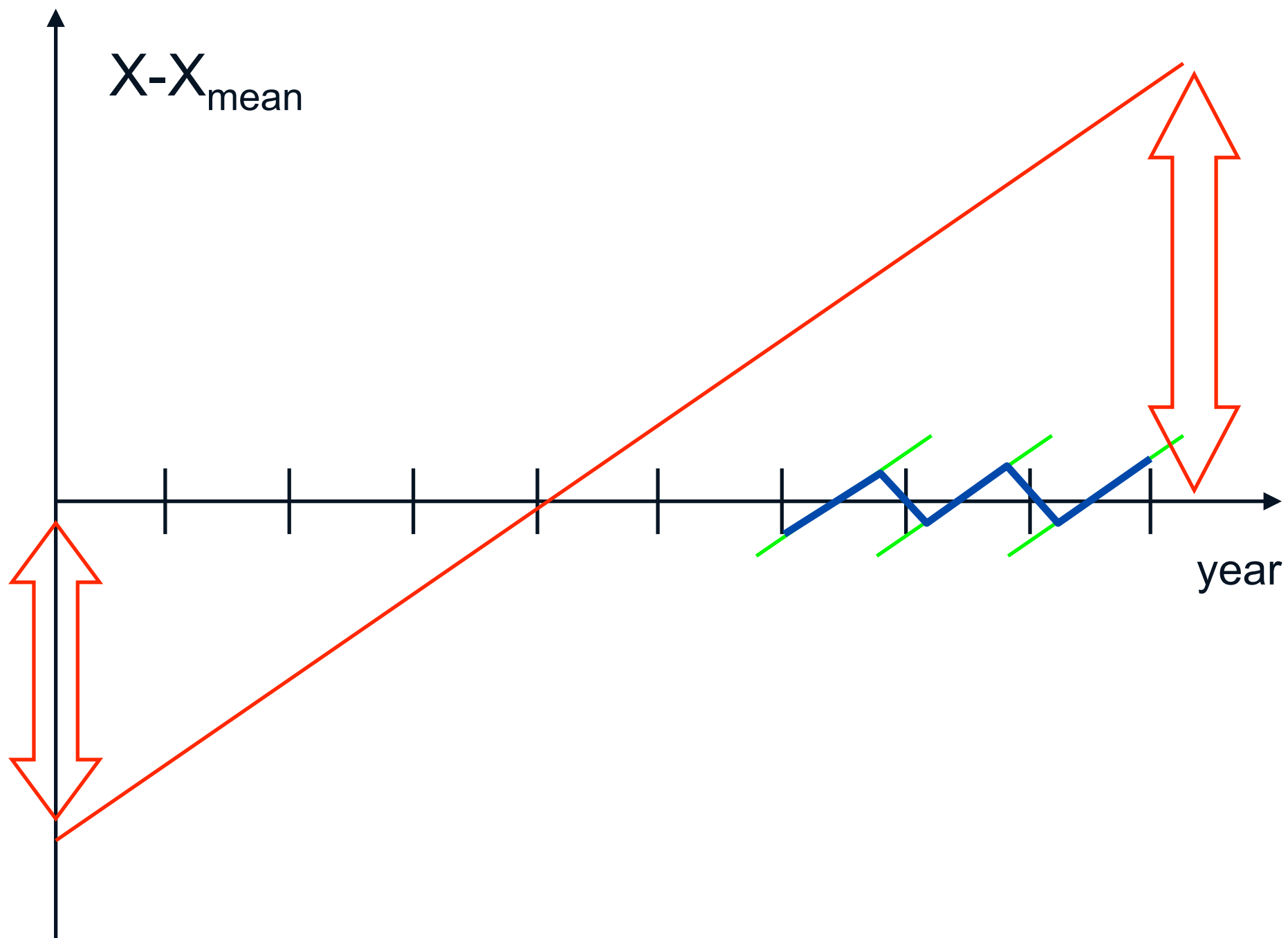


**13 years**



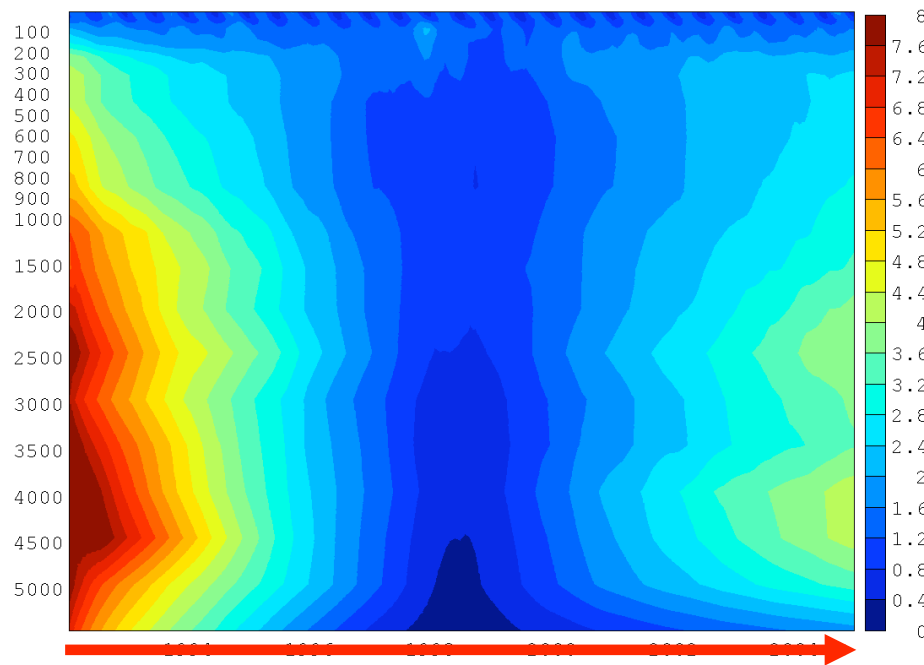
**3 years**



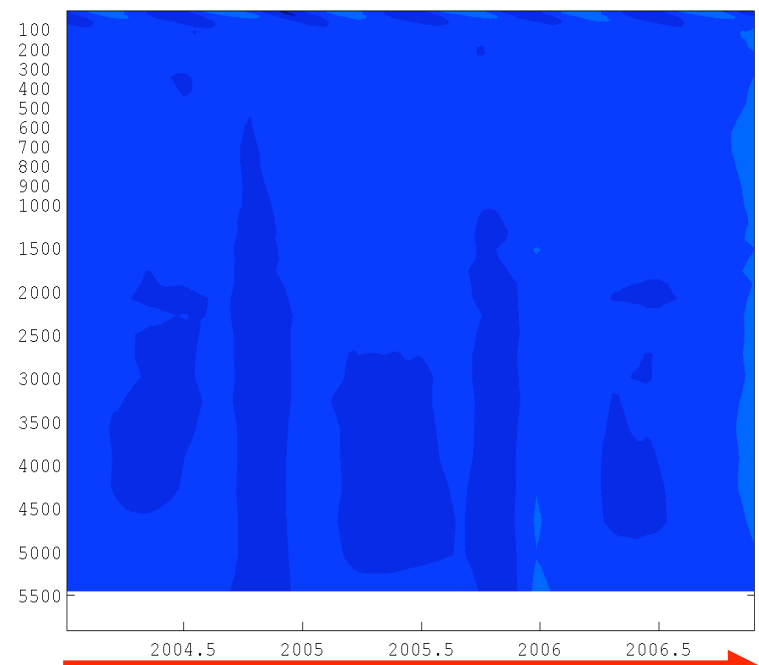


**ECCO1.2**

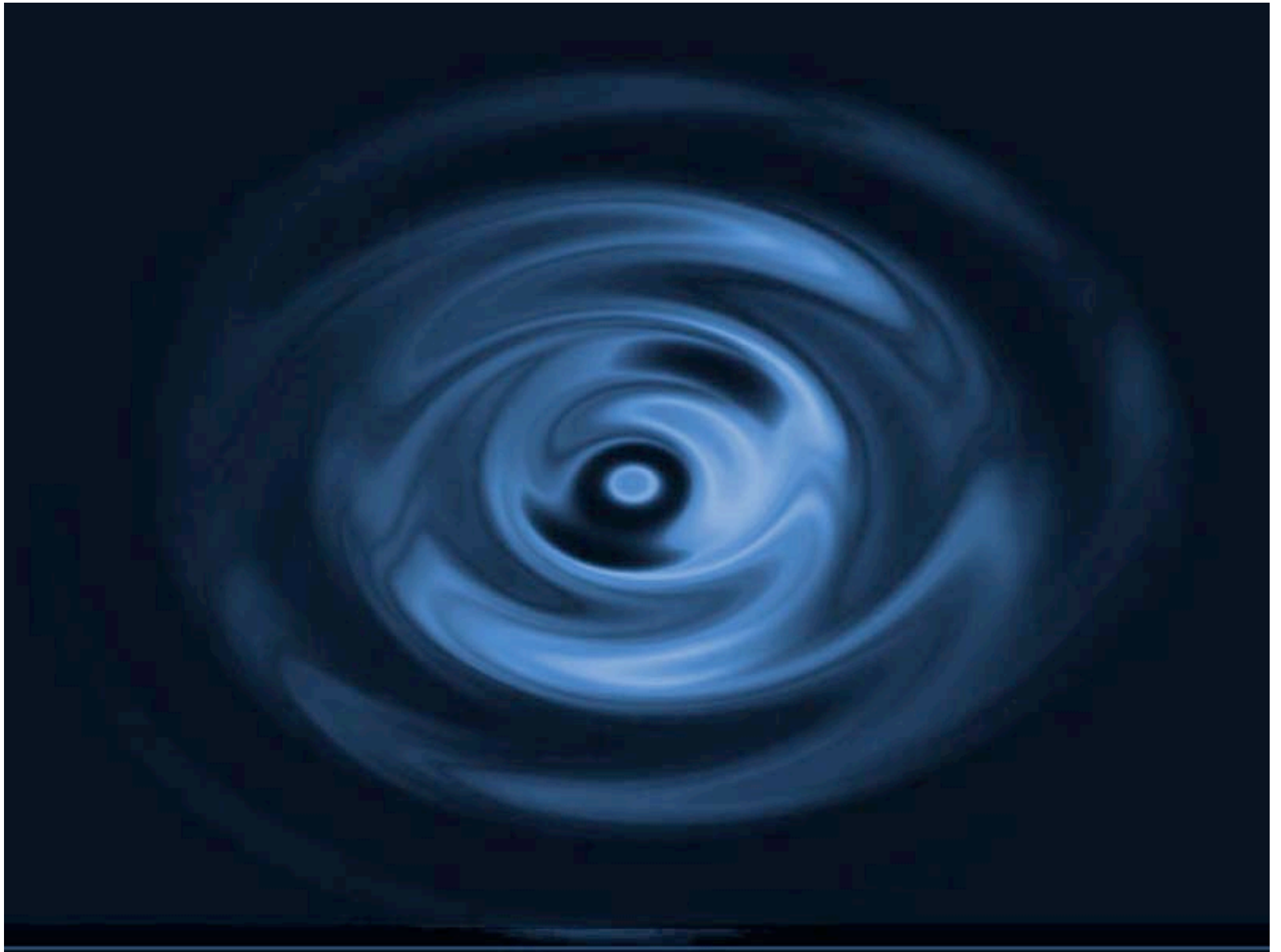
**OCCA**



**13 years**

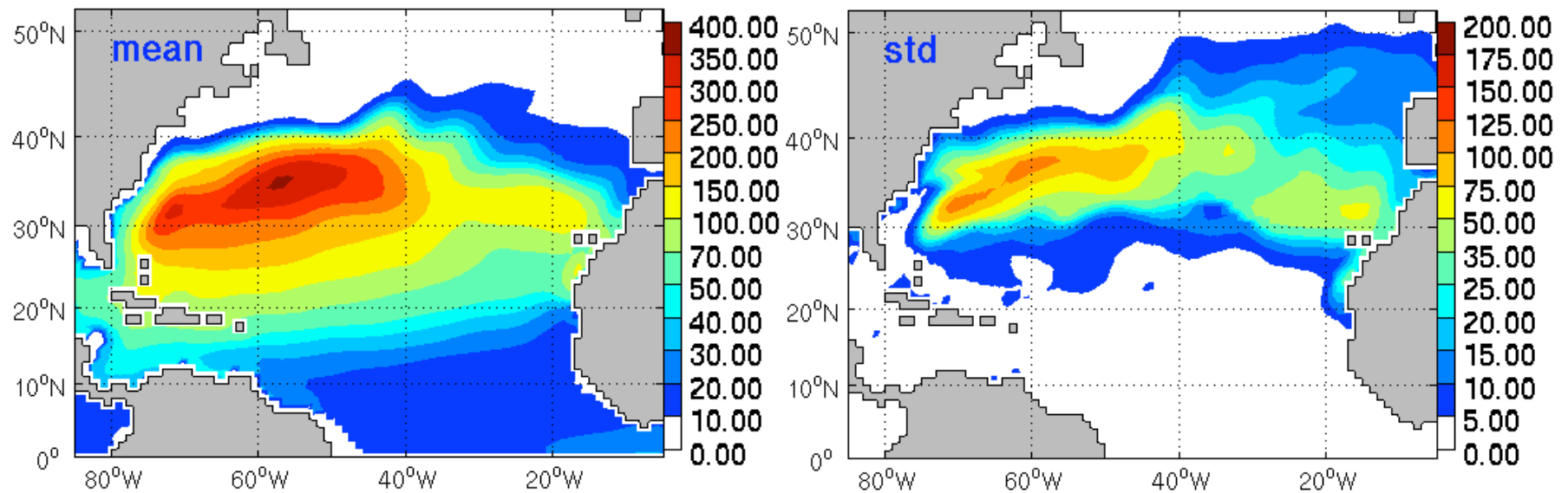


**3 years**

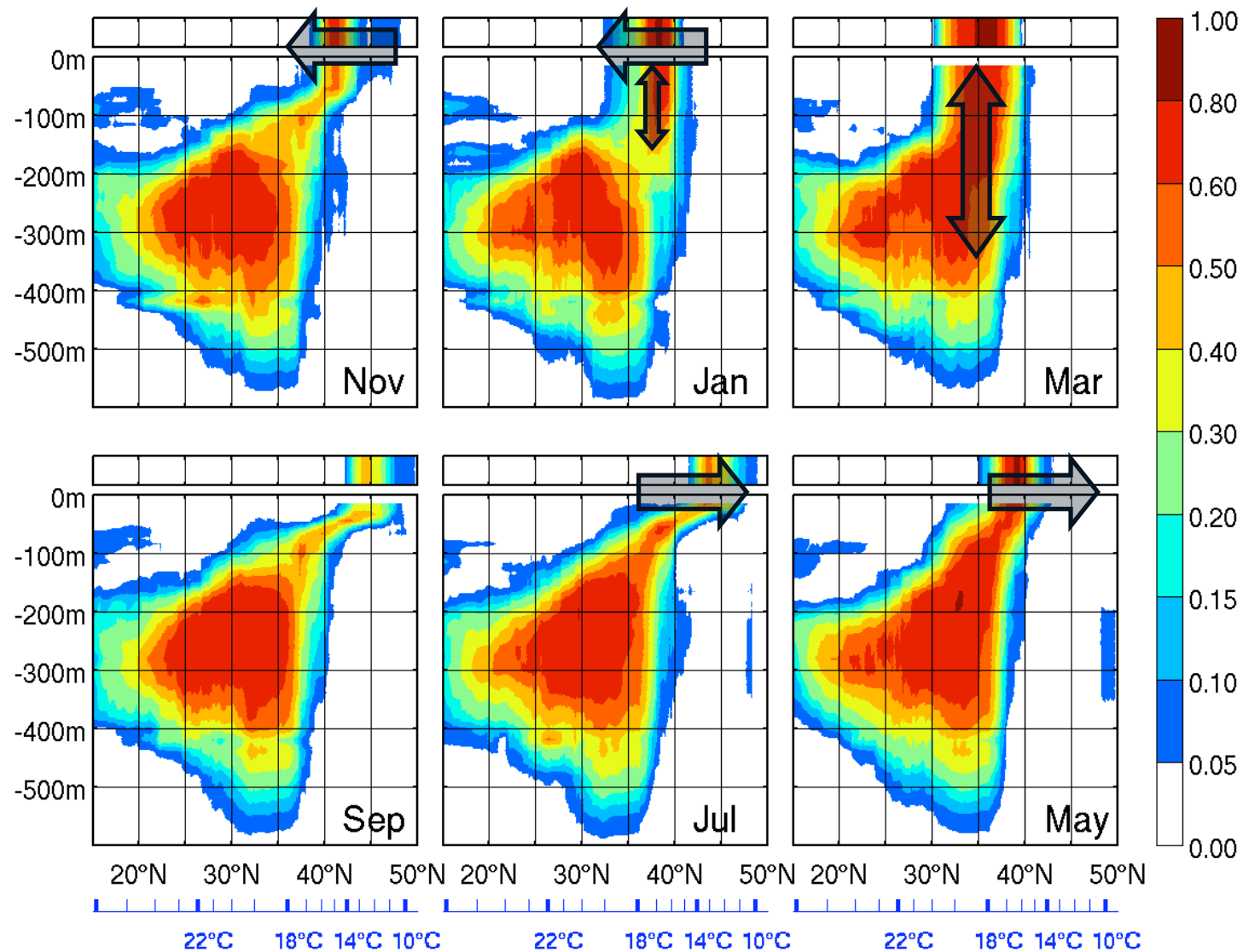




# EDW layer $17 < T < 19^{\circ}\text{C}$



# EDW layer in Argo profiles



# EDW layer in model profiles

